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(54) Blister sheet.

(57) A blister sheet for use in a blister pack comprising a paper sheet which has been thermoformed to provide one or more blister cavities to receiv articles to be packaged, said sheet being made from a blend of cellulosic and/or staple fibres with thermoplastic polymer at least a portion or all of said thermoplastic polymer being fibrillated.

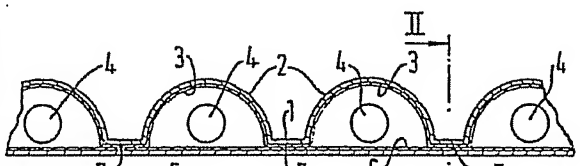

FIG. 1.

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BLISTER SHEET

This invention relates to a blister sheet which is particularly applicable for packaging medicines in the form of capsules, tablets and the like. This type of sheet may, however, also be used when packing other articles which need to be sealed separately prior to use such as metal articles which are susceptible to corrosion.

It is known in the art to package tablets using two sheets of aluminium foil. The tablets are located at spaced intervals between the sheets which are then sealed together in such a way that each tablet is enclosed in an air and moisture proof space. Generally the metal foil is coated with polyethylene which acts as a hot melt adhesive to seal the two sheets together. However a bubble pack of this type requires expensive raw materials and is only suited to manufacture under factory conditions because of the specialised heat sealing equipment required.

Another known sheet of this type is a blister sheet which consists of a polyvinyl chloride sheet which has been formed by heat and pressure into blisters. The articles to be packed are then placed in the blisters and a lidding sheet of aluminium foil applied over the flat surface of the blister sheet to seal the blisters. The lidding sheet is sealed to the blister sheet to form a pack by various means, for example a hot melt adhesive in a heat sealing process. Because of the nature of the pack and the manufacturing process, it is only practicable to manufacture such packs under factory conditions. As a result, the product is limited to the packaging of standard packs, for example aspirin tablets.

It is an object, therefore, of the present invention to provide a blister pack which is cheap to produce and which overcomes, at least in part, the need to use expensive

starting materials and specialised heat sealing equipment.

It has now been found that a relatively inexpensive paper based packaging can be produced which not only enables articles, particularly drug tablets, to be packed in a factory, but which in certain circumstances can be used in shops. For example, it enables such tablets to be packed by a pharmacist in a shop or a hospital in a programmed dosage form.

According to the present invention therefore, a blister sheet for use in a blister pack comprises a paper sheet which has been thermoformed to provide one or more blister cavities to receive articles to be packaged, said sheet being made from a blend of cellulosic and/or staple fibres with thermoplastic polymer at least a portion or all of said thermoplastic polymer being fibrillated.

Examples of thermoplastic polymer in the form of fibrillated fibres are those sold under the trade name SWP by Crown-Zellerbach Corporation and the trade name PULPEX EA by Solvay et Cie.

Preferably between 80% and 90% of the thermoplastic polymer is fibrillated. The exact proportion of fibrillated thermoplastic polymer desirable in the paper sheet will vary with the depth and configuration of the blister cavities to be formed. Preferably the thermoplastic polymer content is between 60% and 95% of the blend.

Thus, the thermoplastic polymer content is preferably at least 75% and where high translucency is required about 85% of the blend.

The sheet may also include coloured or white pigments such as titanium dioxide to confer opacity and resistance to

ultra violet light. The titanium dioxide content should not exceed 20% and for such a proportion of the loading, the thermoplastic polymer content should not be less than 75%

The fibrillated thermoplastic polymer material may, for example, be constituted by a polyolefin such as polyethylene or polypropylene.

Particulate thermoplastic polymer material may be included to supplement the fibrillated thermoplastic polymer material.

Examples of cellulosic and staple fibres which may be used are bleached or unbleached softwood and hardwood sulphite and sulphate pulps, cotton linters and rayon and polyester staple fibres. Of these hardwood sulphate pulp is especially preferred as conferring good thermoformability whilst providing low permeability in the thermoformed sheet.

As a lidding for the blister sheet, conventional aluminium foil may be used or a paper lidding may be provided. Papers such as glassine, greaseproof, tracing or vegetable parchment, which have high burst and low tear resistance characteristics are also appropriate for use as lidding materials. The paper lidding may also comprise a mixture of thermplastic material and cellulose fibres in a ratio of, for example 75% thermoplastic to 25% cellulose.

According to another feature of the present invention the blister sheet may be as set forth above and be formed with a fold line so as to divide it into first and second portions, said first portion having blister cavities formed therein for receiving articles to be packaged so that when articles are located in said cavities the second

portion can be folded along said fold line to provide a lidding sheet which can be adhered to said first portion to form a blister pack separately enclosing said articles.

If desired the said second portion may also be provided with blister cavities which are spaced on said sheet to coincide with said blister cavities on said first portion when the sheet is folded.

Adhesion is preferably achieved by means of a high tack dry latex adhesive which coats sufficient of the planar surfaces of the sheet to ensure that after a lidding sheet has been applied the blisters are isolated from each other and the atmosphere. A layer of such adhesive will only adhere to another layer of the same adhseive, thus obviating the need to provide protective release sheets.

Alternatively the high tack dry latex adhesive may be substituted by other self-adhesives, in which case release sheets, coated for example with silicone release coatings, will be applied to the adhesive coatings as a protection. These release sheets will have apertures which coincide with the moulded recesses of the sheet so that only areas coated with adhesive will be covered by the release sheet. The release sheets will then be stripped off before the sheet is used to form a blister pack. This pack does not require any machinery or factory conditions for assembly and may be easily used by the pharmacist when packing prescribed medicines in his shop. The self-adhesives used may be of any well known kind. Commonly such adhesives are based on natural rubber, styrene butadiene rubber, butyl rubber or polyisobutene as backbone polymers modified with suitable tackifiers and plasticizers.

Further alternative adhesives which may be used are heat activated adhesives which may be of any well known

kind and for example comprise sealing wax, polyvinylidenedichloride, polyethylene or a hot melt adhesive consisting of 30% w/w ethyl-vinyl acetate, 20% w/w tackifying resin and 40% w/w paraffin wax. The thermoplastic content of the sheet of the invention also renders it heat sealable to an appropriate lidding without the use of an adhesive. However special heat sealing machinery is required in both cases and this sealing method would not therefore be suitable for use by the pharmacist.

Adhesive may be applied as appropriate to facilitate adhesion. However the invention is not limited to the use of any particular adhesives and the foregoing merely constitute examples of types of adhesive which may be used. The blister pack may also be provided without adhesive thus allowing the pharmacist to apply his own as necessary.

If the articles to be packed are likely to be subjected to hygroscopic or ultra violet degradation then the sheet used may also incorporate a metal layer provided by vacuum deposition and will generally be of aluminium. Alternately or in addition an ultra violet absorber such as titanium dioxide either in the body of the sheet or as a coating can be included. Titanium dioxide also confers opacity on the sheet. Opacity may also be provided by the use of other coatings, for example, white or tinted inks.

The sheet could also be provided with detachment means in the form of perforations which extend between the sealed blisters so that the patient is able to easily detach each dose in a separate blister. Alternatively weakened lines could be provided by thermoforming or mechanical composition.

The invention further comprises a blister pack formed using blister sheets as above referred to.

The invention will be further described with reference to the accompanying drawings in which :

Figure 1 is a cross-sectional view of a blister pack embodying a blister sheet according to the invention;

Figure 2 is a cross-sectional view on the line II-II of Figure 1;

Figure 3 is a cross-sectional view through a blister pack including a second embodiment of a blister sheet according to the invention which is suitable for use with tablets susceptible to hygroscopic or ultra violet degeneration;

Figure 4 is a cross-sectional view of a third embodiment of packaging element from which a blister pack can be formed.

Figure 5 is a cross-sectional view of a blister pack formed from the sheet of Figure 4;

Figure 6 is a cross-sectional view of a fourth embodiment of packaging element from which a blister pack can be formed;

Figure 7 is a cross-sectional view of a blister pack formed from the sheet of Figure 6;

Figure 8 is a cross-sectional view of a blister pack formed from a fifth embodiment of packaging element according to the invention.

In the construction shown in Figures 1 and 2 a blister sheet 1 is made from a mixture of cellulosic and fibrillated synthetic thermoplastic fibres. The synthetic fibres used are those sold under the Trade name SWP by Crown Zellerbach Corporation. The proportion of fibrillated thermoplastic polymer desirable in the paper sheet will vary with the depth and configuration of the blister cavities to be formed. The thermoplastic polymer therefore is between 75% and 80% and is made up from approximately 75% fibrillated fibres and 25% particulate material. The remainder of the blend comprises the cellulosic and staple fibre material and this can be hardwood sulphate pulp,

In order to provide opacity to the sheet a proportion of pigment such as titanium dioxide is also included.

An alternative blend of materials suitable for the construction shown in Figures 1 and 2 comprises a blend of synthetic thermoplastic fibre material of the kind sold under the trade name PULPEX EA by Solvay et Cie. In this blend high translucency is achieved by including thermoplastic polymer amounting to about 85% of the blend, the remainder again being hardwood sulphate pulp. Once again with this embodiment at least 60% of the thermoplastic polymer is in fibrillated form, the remainder being particulate.

The sheet may be formed on a conventional papermaking machine and when it it to be made up into a blister sheet it is moulded by thermal deformation to provide blisters 2. The blister sheet 1 has coated thereon a layer of high tack dry latex adhesive 3 and contains within its blisters 3 drug tablets 4.

A lidding sheet 5 carries thereon a layer 6 of the same high tack dry latex adhesive. The adhesive layers 3 and 6 are mutually adhesive but will not adhere to any other surface. They are sealed together at the locations 7 between the blisters so that each tablet 4 is isolated.

The lidding sheet 5 is made of paper, and preferably of a paper having high burst and low tear resistance characteristics. This ensures that inadvertent rupture of the lidding sheet is minimised whilst ensuring that after intentional rupture, it will tear easily to release a selected tablet. Such papers are exemplified by glassine, greaseproof, tracing and vegetable parchment papers, burst and tear characteristics for which are set out in the following table :

PAPER TYPE		UNITS	COATED GLASSINE (AS HEREIN DEFINED)	GLASSINE	TRACING	GREASEPROOF	VEGETABLE PARCHMENT
GRAMMAGE		grams per square metre (gm/m^2)	68	39	54	51	40
BRITISH STANDARD TEST METHOD 3137/1972	BURST	Kilo Newtons per square metre (KN/m^2)	138	104	163	139	130
	BURST FACTOR		2.0	2.7	3.0	2.7	3.3
BRITISH STANDARD TEST METHOD 4468/1969	MACHINE DIRECTION TEAR RESISTANCE	Milli Newtons (mN)	240	100	130	135	120
	TEAR FACTOR		357.9	239.9	263.7	257.7	304.6
BRITISH STANDARD TEST METHOD 4468/1969	CROSS DIRECTION TEAR RESISTANCE	Milli Newtons (mN)	280	120	160	180	120
	TEAR FACTOR		410.6	309.3	295.2	351.6	304.6

In the foregoing embodiment, the use of layers of mutually adherent tack dry latex adhesive has been proposed. However, it will be appreciated that self-adhesive layers may be readily substituted, in which case, release sheets, coated for example with silicone release coatings will be applied to the adhesive coatings as a protection, the release sheets being stripped off before the blister and lidding sheets are sealed together. Alternatively, where the lidding sheet is to be sealed to a blister sheet comprising thermoplastic material, such as polyvinyl chloride or polyethylene, it may carry a layer of heat seal adhesive. In this case, the lidding sheet will be sealed to the blister sheet by appropriate heat sealing equipment.

Referring now to Figure 3, this shows a modification of the embodiment of Figures 1 and 2 particularly suited for packing articles 10 which are susceptible to ultra violet and/or hygroscopic degeneration. The construction and assembly of the blister pack is generally as described above with reference to Figures 1 and 2 and where appropriate, the various parts are designated by the same reference numerals. In this case however the outer surfaces of the blister and lidding sheets 1 and 5 are provided with metal layers in 11 and 12 respectively. The metal layers are provided by vacuum deposition, for example of aluminium. The provision of a metal layer has a further advantage in that it renders both the blister pack and lidding sheet opaque and thus conceals the contents from children who might otherwise identify them as sweets or candies.

In Figure 4 a sheet 21 is shown which may optionally carry printed materials and is made from a blend of cellulose and synthetic fibres together with suitable known binders. The sheet 21 is also coated with a cold seal adhesive 24. The sheet is moulded, for example by thermal deformation to provide blisters 22, being divided into

first and second portions by a fold line 23. Capsules or the like 25 are placed in the blisters so that when the sheet is folded about the fold line 23 as indicated by the arrow X the second portion acts as a lidding sheet and the capsules become sealed in a blister. Information such as names, dates or dosage may be manually applied on the flat surface 26 at this stage.

In Figure 5 the sheet 21 of Figure 4 is shown after folding along the fold line 23. The cold seal adhesive 24 seals the capsules into the blisters to form a blister pack.

Referring now to the embodiment of Figure 6 the sheet 21 has blisters 22 spaced from either side of the fold line 23 so that on folding as indicated by the arrow X, the recessed areas in one portion coincide with the blisters in the other portion.

In Figure 7 the sheet 21 of the second embodiment is shown after folding along fold line 23 in direction X. As, before, sealing is effected by the cold seal adhesive 24, and the second portion again acting as a lidding sheet.

In the embodiment of Figure 8 the sheet 21 has been provided with a metal surface layer 27 by vacuum metallization. Apart from this the construction is the same as that shown in Figure 5 and is particularly suitable for packing articles which are susceptible to hygroscopic or ultra-violet degradation. This metal layer is provided by vacuum deposition of aluminium after the sheet has been formed.

It will be appreciated that each of the foregoing Figures shows only part of a sheet which will be covered with a large number of recessed areas.

CLAIMS

1. A blister sheet for use in a blister pack comprising a paper sheet which has been thermoformed to provide one or more blister cavities to receive articles to be packaged, said sheet being made from a blend of cellulosic and/or staple fibres with thermoplastic polymer at least a portion or all of said thermoplastic polymer being fibrillated.

2. A blister sheet as claimed in claim 1 in which between 80% and 95% of the thermoplastic polymer is fibrillated.

3. A blister sheet as claimed in claim 1 or claim 2 in which the thermoplastic polymer content is between 60% and 95% of the blend.

4. A blister sheet as claimed in claim 3 in which the thermoplastic polymer content is between 75% and 85% of the blend.

5. A blister sheet as claimed in any one of the preceding claims in which the sheet also includes coloured or white pigments.

6. A blister sheet as claimed in claim 5 in which the pigements include titanium oxide.

7. A blister sheet as claimed in claim 6 in which the titanium oxide content does not exceed 20%.

8. A blister sheet as claimed in claim 7 in which the thermoplastic polymer content of the blend is not less than 75%.

9. A blister sheet as claimed in any one of the preceding claims in which the fibrillated thermoplastic polymer is a polyolefin.

10. A blister sheet as claimed in claim 9 in which the polyolefin is polyethylene or polypropylene.

11. A blister sheet as claimed in claims 1 to 10 in which the cellulosic and/or staple fibres are bleached or unbleached softwood and hardwood sulphite and sulphate pulps, cotton linters and rayon and polyester staple fibres.

12. A blister sheet as claimed in any one of the preceding claims in combination with a lidding made from conventional aluminium foil, or paper.

13. A blister sheet as claimed in claim 12 in which the paper is glassine, greaseproof, tracing or vegetable parchment, or a mixture of thermoplastic polymer material and cellulose fibres.

14. A blister sheet as claimed in claim 13 in which the ratio of thermoplastic material and cellulose is 75% thermoplastic and 25% cellulose.

15. A blister sheet as claimed in any one of the preceding claims 1 to 11 in which the sheet is formed with a fold line so as to divide it into first and second portions, said first portion having blister cavities formed therein for receiving articles to be packaged so that when articles are located in said cavities the second portion can be folded along said fold line to provide a lidding sheet which can be adhered to said first portion to form a blister pack separately enclosing said article.

16. A blister sheet as claimed in claim 15 in which said second portion is also provided with blister cavities which are spaced on said sheet to coincide with said blister cavities on said first portion when the sheet is folded.

17. A blister sheet as claimed in any one of the preced-

ing claims in which a high tack dry latex adhesive is applied which coats sufficient of the planar surfaces of the sheet to ensure that after a lidding sheet has been applied the blister cavities are isolated from each other and the atmosphere

18. A blister sheet as claimed in claim 17 in which the high tack dry latex adhesive is substituted by another self-adhesive provided with a release sheet which has apertures aligned with the blister cavities.

19. A blister sheet as claimed in claim 10 in which the release sheet is coated with a silicone release coating.

20. A blister sheet as claimed in claim 18 or claim 19 in which the self-adhesive is based on natural rubber, styrene batadiene rubber, batyl rubber or polyisobutene as a backbone polymer modified by a suitable tackifier and plasticizer.

21. A blister sheet as claimed in claim 17 in which the high tack dry latex adhesive is substituted by a heat activated adhesive.

22. A blister sheet as claimed in claim 21 in which the heat activated adhesive is sealing wax, polycinylidenedichloride, polyethylene or a hot melt adhesive consisting of 30% W/W ethyl-vinylacetate, 20% W/W tackifying resin and 40% W/W paraffin wax.

23. A blister sheet as claimed in claim 18 or claim 16 in which the adhesion is achieved by heat sealing the first and second portions together.

24. A blister sheet as claimed in any one of the preceding claims in which the sheet is provided with a metal layer.

25. A blister sheet as claimed in claim 24 in which the metal layer is provided by vacuum deposition.

26. A blister sheet as claimed in any one of the preceding claims in which the sheet includes an ultra violet absorber.

27. A blister sheet as claimed in claim 26 in which the ultra violet absorber is titanium chloride which is applied to the sheet as a coating or is included in the blend.

28. A blister sheet as claimed in any one of the preceding claims in which an opaque coating is applied to the sheet.

29. A blister sheet as claimed in claim 28 in which the opaque coating is applied by white or tinted inks.

30. A blister sheet as claimed in any one of the preceding claims provided with detachment means which extend between the blister cavities to facilitate detachment of the blisters.

31. A blister sheet as claimed in claim 30 in which the detachment means are provided by lines of weakness as perforations.

32. A blister pack formed using a blister sheet as set forth in any one of the preceding claims.

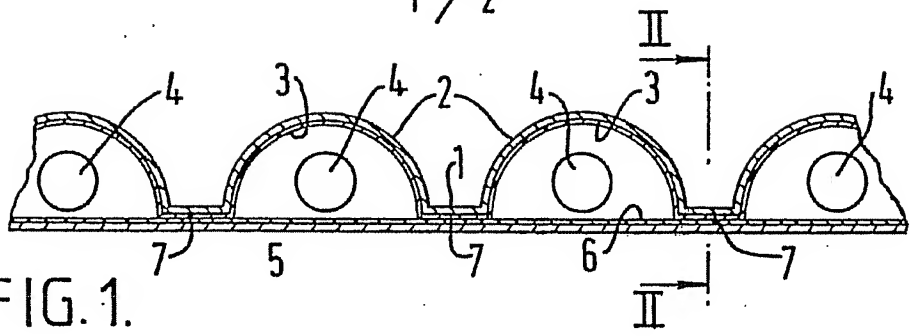

FIG. 1.

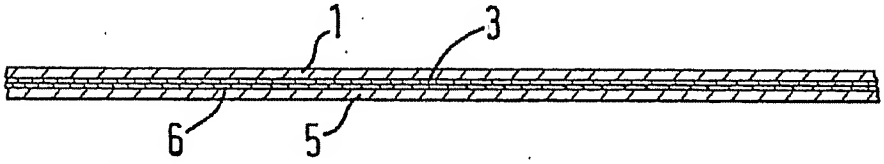

FIG. 2.

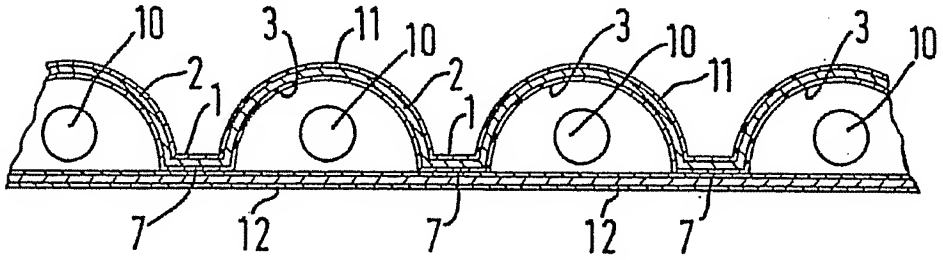

FIG. 3.

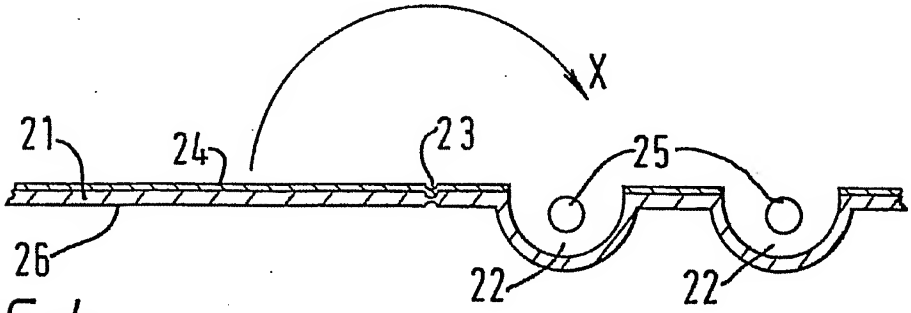

FIG. 4.

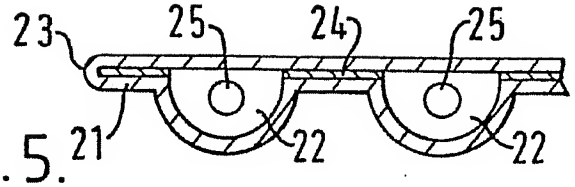

FIG. 5.

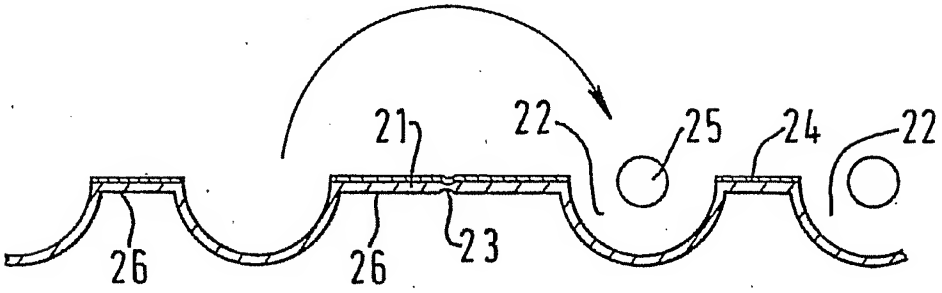

FIG. 6.

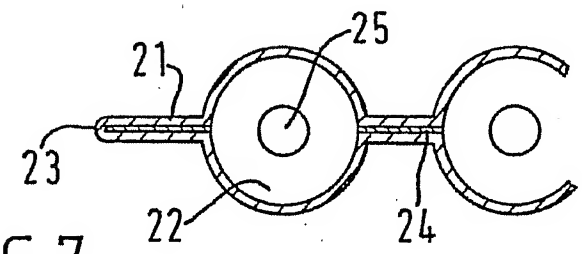

FIG. 7.

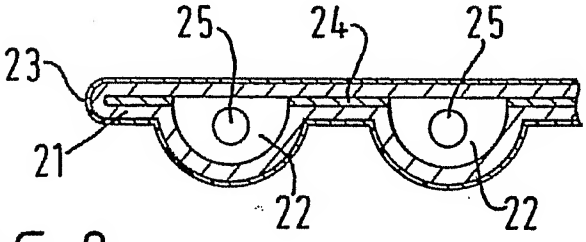

FIG. 8.

European Patent Office

EUROPEAN SEARCH REPORT

0118975

Application number

EP 84300418.5

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	DE - A1 - 3 029 253 (DIXIE UNION) * Page 12, lines 1-10 *	1,12	B 65 D 75/34 B 65 D 85/56
Y	DE - A - 2 208 554 (CROWN ZELLERBACH) * Page 7, lines 1-11; page 17, lines 18-20 *	1,12	
A		2-14	
A	EP - A1 - 0 015 338 (GULF OIL CORPORATION) * Totality *	1-14	
A	US - A - 4 083 451 (HAIR) * Totality *	1,15, 16	
A	US - A - 3 630 346 (BURNSIDE) * Totality *	1,17-20	
A	CH - A - 234 004 (GÜNZACH GMBH) * Page 3, lines 13-26 *	26,27	
A	US - A - 3 202 277 (LEWI) * Totality *	1,17, 20-23	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

B 65 D 65/00
B 65 D 75/00
B 65 D 85/00
D 21 H 5/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	28-05-1984	MELZER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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